NUMI Fluorinert System
Design Review Feedback

A Design Review for the NUMI Kicker Fluorinert cooling system was held on Friday, June 14, 2002. As a member of the review panel, here are my comments. There was excellent coverage of topics by a number of panel members, and I'll restrict my discussions to particular points of interest to me.

First, in studying the design and materials:

1) The excess use of gauges and valves in the filter line is to be commended. Often, filter lines are equipped with isolation valves at each end only. And, although having pressure gauges between each filter is very good practice from a diagnostic point of view, they are sometimes excluded due to cost.

Changing a single filter can easily dump 1/4 to 1/2 gallon of fluid. A series of filters in a row, unisolated by valves, can dump more, even if only one filter in the series is opened. If it is necessary to open and check each of the filters, wastes go up. At $400 per gallon, Fluorinert is a very costly fluid. The losses experienced on the very first access of the filters for service and maintenance can more than pay for the minimal added expense of the two extra valves and gages in the filter line.

2) Somewhat cheaper, reliable glycerin gauges are available. This cost may be reduced by 20 to 30% if buying in quantity, from a total of $1500 to say $1100 or $1200. The caution here is, you get what you pay for. In the LCW group's extensive experience, cheap gauges such as those stocked by the Fermilab stockroom, unfilled and smaller in size, do not have the quality, reliability or service life to support their use.

Also, one vendor, Swagelok, has introduced a new line of gauges that are connected via tube stubs and compression fittings instead of 1/4" NPT threaded joints. Although I do not have current pricing, they may be a good way to compromise between the need for information, and the concern of NPT joints leaking Fluorinert.

3) Although the CHW lines are piped through the length of the MI-60 gallery in stainless steel, from the point where the Fluorinert skids will tap into them could be a cheaper material. Carbon steel, or even hard piped copper could be used. This could substantially reduce the costs of piping materials.

4) In the review meeting, I had spoken up about the temperature control valve placement before the heat exchanger. Upon further study, its placement in the CHW supply line to the heat exchanger looks fine to me. There are two schools of thought here, the first, that placing it after the exchanger helps ensure the exchanger stays flooded, the second, that placement after the unit submits the unit to undue pressure load. In this use, the lines returning from the exchanger to the CHW system are long, and above the exchanger, and it should easily remain fully flooded after initial fill.

Second, in construction contractors, T&M vs. fixed price:

In my experience, this project is at the dividing line between which method would be best. If all necessary drawings, specifications, bids and permits can be acquired in time that this project can be part and parcel of a larger package, and that the timeline of the project does not suffer, I think the fixed price bids method would be prudent.

If, however, there is not a suitable larger package this can ride on, and / or the deadlines cannot be met, T&M may be the wisest choice. Although I have heard much criticism concerning T&M crews not having motivation, in my extensive experience, the current crews at Fermilab can and do provide competent and sufficiently expedient work for many small or miscellaneous projects, enough so to offset some of the extra time, work, and hassles of running a bid package through the system.